SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LV.—No. 14. [NEW SERIES.] NEW YORK, OCTOBER 2, 1886. [Price 10 Cents. $3.00 per Year.

THE DEMAGNETIZATION OF WATCHES.

BY GEO. M. HOPKINS.

The chances of injury to watches by magnetization have been greatly multiplied by the development of the dynamo and its extensive application to electric lighting and other purposes, so that it is very common to find magnetized watches in the hands of persons having no connection whatever with electrical matters. A watch readily becomes sufficiently magnetized to derange its action and render it entirely unreliable. Proximity to a dynamo is not necessary to accomplish it.

The writer, after faithfully protecting a phenomenally accurate timepiece for years against the damaging influence of dynamos by leaving it behind while visiting lighting stations and other places in which heavy electrical currents were generated or used, suddenly found the watch behaving in a very erratic manner, gaining enormously one day and losing the next; but the strange action was not charged to magnetization, as great care had been taken to avoid it. After a week's stay at the watchmaker's, the timepiece was returned to its owner, together with a bill of five dollars for demagnetization. But for the undoubted integrity of the watchmaker, the bill would have been questioned. The remembrance of the free use of a permanent magnet about the time of the failure of the watch gave reasonable ground for the supposition that the watch might have received its magnetism from that apparently insignificant source. After demagnetization, the watch ran well, but it soon suffered its former fate. This time, however, the watchmaker did not receive five dollars. The writer, knowing the cause of the trouble, effected a cure quickly and without expense.

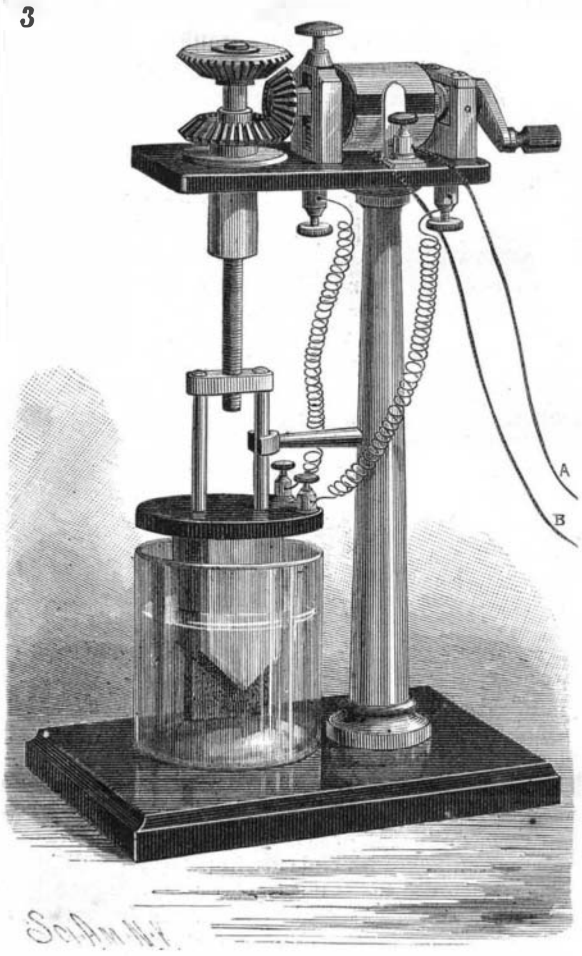
The remedy in this case is administered on the purely homeopathic principle, *Similia similibus curantur*. If the watch is suffering from an attack of magnetism, magnetism must effect the cure, but much depends on how the curative is applied.

Fig. 1 shows simple apparatus for destroying the magnetism of watches. Fig. 2 is a diagram showing the electrical connections. Fig. 3 represents a demagnetizing machine based on the principle embodied in the apparatus shown in Fig. 1; and Fig. 4 is a diagram showing the electrical connections of the machine.

The simple apparatus consists of a flat coil large enough to inclose a watch, a current-reversing key, or switch, and a plunging battery. One cell of Grenet battery is sufficient. The coil consists of about 225 convolutions of No. 18 magnet wire (Am. W. G.) Its longer internal diameter is 2¼ inches, its short diameter is ¾ inch, and its width is 2¼ inches. The resistance of the coil is 1¼ ohms. Referring to the diagram, Fig. 2, the terminals of the coil, I, are connected with the studs, G H, on which are pivoted the switch arms. The switch arms are pivoted to a vulcanite bar, which maintains a uniform distance between them. To the base, and in the path of the free ends of the switch arms, are secured the contact buttons, E, C, F. The middle button, C, is connected electrically with the binding post, B, and the outside buttons, E, F, are connected with the binding post, D. The binding posts, B, D, communicate electrically with the poles of the battery, A.

The watch to be demagnetized is placed in the coil, and, while the switch arms are swung back and forth at the rate of about one complete excursion per second, the zinc of the battery is slowly plunged and as slowly withdrawn from the battery solution. When the switch arms touch the buttons, C, E, the current passes from the battery, A, to the binding posts, B, D, thence to the buttons, C, E, and through the switch arms to the studs, G, H, and coil, I. When the switch arms touch the buttons, C, F, the current passes in the reverse direction through the coil.

3



MACHINE FOR DEMAGNETIZING WATCHES.

The success of the operation depends entirely on the regularity with which the current is reversed and the uniformity with which the zinc of the battery is plunged and withdrawn. A considerable pause of the switch arms on one pair of buttons will exhibit its effect in the preponderance of the magnetism, due to the continued flow of the current in one direction during the pause. An irregularity of this kind will necessitate beginning again.

The watch is tested to ascertain, in the first place whether it is magnetized and in need of treatment of this kind, and afterward to determine whether the treatment was effectual by presenting its different sides to a compass needle or, better, an ordinary cambric needle magnetized and suspended by a single fiber of silk attached to its center. The attraction of the needle by the watch is not positive evidence of its magnetization; but if one end of the needle is attracted by one side of the watch and repelled by the other side, it indicates that the watch is magnetic.

The machine shown in Figs. 3 and 4 has been devised to insure the regular reversing of the current and the uniform plunging and withdrawal of the battery zinc.

The zinc and carbon plates of the battery are suspended by a yoke which is engaged by a screw arranged to revolve in a sleeve supported by the vulcanite plate attached to the top of the column. As the screw is revolved in one direction on the other, the yoke travels up or down on the screw, carrying with it the plates of the battery.

To the screw above its journal are secured two bevel wheels, either of which may be engaged by the pinion on the swinging horizontal commutator shaft.

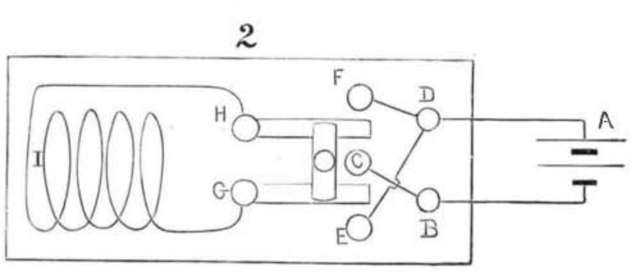
The commutator is of the kind commonly used on induction coils. It consists of a cylinder of vulcanite mounted on a shaft divided in the middle into two halves, C, I (see Fig. 4), and having on diametrically opposite sides curved metallic plates, D, H; the plate, D, communicating electrically with the part, C, of the shaft, the plate, H, communicating with the part, I. The shaft, I, is journaled in a box pivoted in the standard, J, and is provided with a hand crank at its outer extremity. The shaft, C, which carries the pinion, is journaled in a spring-supported box arranged to slide in a mortise in the standard, B. The spring-supported box is provided with a knob, K, by which it may be depressed. Springs, G, E, which press opposite sides of the commutator cylinder, communicate electrically with a coil, F, like that already described. The current flows from the battery, A, to the standard, B, thence through the shaft, C, plate, D, spring, E, coil, F, spring, G, plate, H, shaft, I, and standard, J, back to the battery. By pressing down on the knob, K, the pinion is brought into engagement with the lower bevel wheel on the screw.

If the crank be turned, the battery plates will be gradually lowered; at the same time, the direction of the current through the coil will be regularly reversed by the commutator. When the plates have been plunged sufficiently, the knob, K, is released, when the spring raises the commutator shaft and brings the pinion into engagement with the upper bevel wheel, and the screw is turned in the opposite direction gradually, withdrawing the plates from the battery solution.

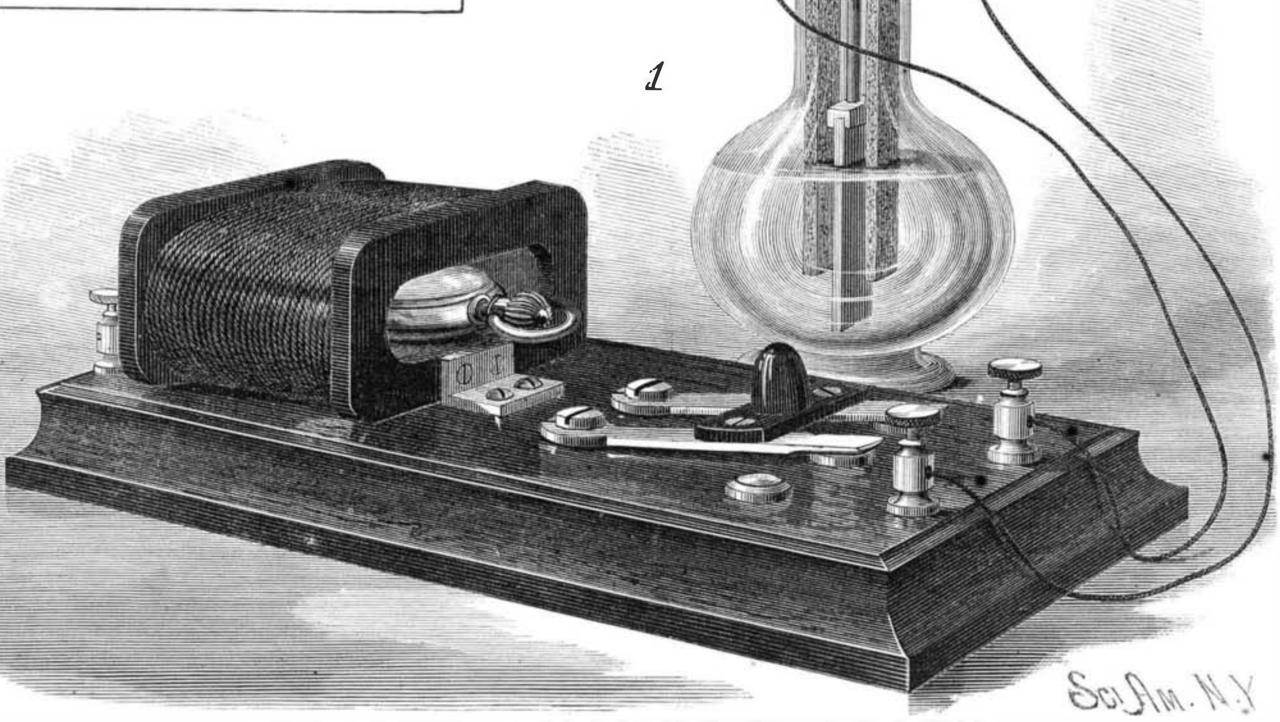
To cause the solution to readily leave the zinc plates, they are made angular at their lower ends. This device also diminishes the strength of the current

(*Continued on p.* 212.)

2



1

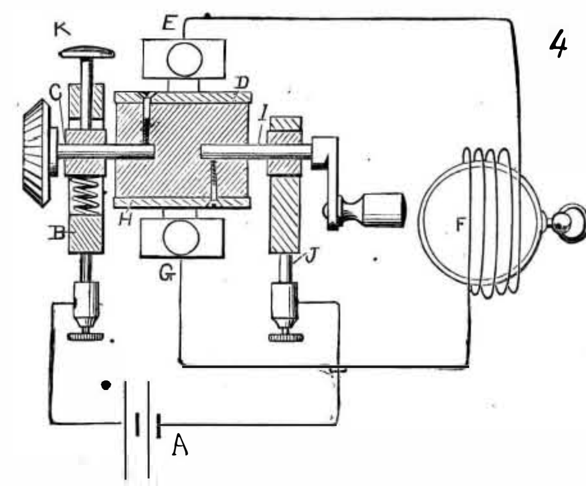


SIMPLE APPARATUS FOR DEMAGNETIZING WATCHES.

THE DEMAGNETIZATION OF WATCHES.

(Continued from first page.)

as the zincs are withdrawn. The connection between the battery and the standards, B, J, is made by means of spirals to permit of the free movement of the battery plates. The binding posts attached to the commutator springs are connected by wires, A, B, with a coil like that shown in Fig. 1.



ELECTRICAL CONNECTIONS OF THE DEMAGNETIZING MACHINE.

If the first treatment of a watch does not entirely demagnetize it, the operation should be repeated without plunging the battery plates deeply.

Protection of War Ships with Rubber.

The experiment which lately took place with the Resistance at Portsmouth is important, and deserves notice. The necessity for thickening armor in order to meet the rapidly increasing power of ordnance led to the consideration as to what parts of the ship might be left without armor without actual danger to her existence or efficiency as a fighting machine. Hence certain portions, such as the water line amidships, the magazines, engines, sufficient hull to secure the vessel remaining afloat, and principal guns have been included in the category of so-called vital parts, and have been protected by vertical or horizontal armor, while other portions have been allowed to take their chance with thin armor, or nothing more than the thin steel or iron side of the ship. This system of construction, says the *Engineer*, led to the development of quick fire attack, carried on by guns loaded by hand, but supplied with fixed ammunition, that is, ammunition in which charge, projectile, and cap were contained in a single metal case, as in small arm cartridges. By this means, coupled with arrangements for bringing the gun back into position after recoil, 6 pounder and 3 pounder guns can be fired very rapidly. In fact, a rate of seventeen rounds a minute without aiming, or twelve rounds taking aim, can be maintained for some time; consequently, unarmored or slightly armored parts of a ship may be cut away at a rate which endangers her safety. For while a few rounds even from large guns might not cause intolerable inconvenience, the destruction of the sides by quick fire, which might be applied to nibble the structure rapidly away just at the most important parts, might, it is thought, quickly endanger the ship or reduce her to impotency by hampering her movements. Large holes, well forward and near the water line, for example, would cause water to enter freely when the ship moved quickly. This, at all events, has been strongly urged. Captain Fitzgerald, in a paper read at the United Service Institution on January 21, 1885, argued that the Hercules by this means could disable the much more formidably armed and more modern Italia before the latter could fire her four 100 ton guns more than once. Captain Fitzgerald, we believe, has subsequently advocated strongly the employment of India rubber for unprotected parts of ships. Preliminary experiments appeared to show that a thick sheet of India rubber would close up after a machine gun or even a quick fire gun bullet had passed through it, so as to prevent the entrance of water. Asbestos and cork have been similarly used under the appellation of contrivances. This is the question which was tried at Portsmouth on August 26. The Resistance was anchored in St. Helen's Roads, in 5½ fathoms of water, with 300 tons of ballast to give her a list to starboard. The India rubber sheets, of various thicknesses, were fixed inside the vessel, divided into compartments numbered from 1 to 4, on the port side, which was heeled up out of the water. The Pincher fired two rounds of steel shells from 6 pounder quick firing gun, which passed through No. 1 compartment, "tearing into shreds the India rubber," which was placed at 3½ feet from the ship's plates, and passing through two bulkheads, splintering the wood in all directions. The Blazer then fired with 5 inch breech loading common shell weighing 50 pounds. In No. 3 compartment, where the India rubber was only ½ inch thick, it was torn away, the shell smashing the bulkheads in the rear, but not passing through the ship. A clean hole was made in the ship's plate. Two more similar shells were fired through 1 inch India rubber, and two through 1½ inch; 6 inch gun shells were afterward fired through 1½ inch India rubber. On righting the ship, water entered the holes so fast that they had to be plugged to prevent the vessel from sinking. The Pincher then fired her 6 pounder quick firing gun against a part of the Resistance's hull which was covered outside with India rubber, and another part lined with asbestos 14 inches thick, supported by a thin steel plate. Seen from outside, it appeared as if little damage had been done; but the shots had passed in through the India rubber, carrying debris with them, and water poured in freely. The asbestos closed up behind the shot.

The most important part of the trial is the action of the 6 pounder quick firing gun shell, for the reason given above—that it is by quick fire that destruction to unarmored parts of ships is threatened. The larger shells could hardly fail to cause leakage, but they can only be delivered comparatively slow. It was hoped that the remarkable action of closing in of the India rubber might have been effectual in keeping out water; but it is not surprising that this should not be the case under any great pressure of water. The results are thought sufficiently discouraging to prevent further trial at present.

NEW ORLEANS.*

On the twentieth of December, 1803, France ceded Louisiana to the United States, and New Orleans became American. Despite the eighty-three years that have passed, the influence of the French character is still very manifest in this great city, which now numbers more than 216,000 inhabitants, of which about 20,000 are compatriots of ours.

The gayety and bustle that prevail in the streets have not the same character as in the other cities of the United States, and in certain quarters one might almost believe that he was in a French land.

Moreover, our language is still extensively spoken here, the ordinances and handbills are to-day translated into French, and the inhabitants of the low quarters of the city would not find it convenient to remain there without being familiar with our tongue.

A large number of streets still bear French names, and the same is the case with the merchants' signs.

It is also observed that the old colonists, the representatives of France in this city, have left marked traces of themselves here, but these are gradually disappearing, day by day, and will doubtless soon be destroyed forever.

If there is any port in the world of strange and picturesque aspect, it is that of New Orleans.

From September to December, an army of laborers —negroes and mulattoes—is employed in gathering the cotton crop in the interior of the State.

The railways, and especially the steamboats, carry immense loads, and business receives a great impetus.

The steamboats, like floating fortresses with walls formed of bales of cotton, come from all quarters, and deluge the wharves and storehouses with the harvested crop. These vessels will sometimes carry 5,000 or 8,000 bales or more. One of them, the Henry Frank, which is 300 feet in length, and of 2,600 tons burden, made a sensation on the wharves on April 20, 1881, and her captain received an ovation because of her extraordinarily heavy cargo. This consisted of 9,226 bales of cotton, 1,213 bags of cottonseed, 1,224 bags of oil cake, 500 bags of various grains, and 27 packages of different kinds. The whole may be estimated as equal in weight to 10,226 bales of cotton. Up to that time a steamer of this kind had never been known to carry so heavy a cargo.

Our engraving represents a steamer analogous to the one just mentioned, the E. D. Richardson, which, as may be seen, is unloaded.

The method of loading is curious. Throughout nearly the entire length of her deck the steamer is provided with an immense central saloon for passengers, at the sides of which are staterooms for the accommodation of more than two hundred persons, and various rooms for the service, and so forth. This saloon gets light from a covered gallery, which serves also as an external promenade. The next deck is constructed in the same way, and this is surmounted by a third, all three of them being elegantly decorated. On a level with the main deck a wide platform, supported here and there by the iron beams that form part of the structure of the grand saloon and staterooms, increases the general surface of the steamer. The one on the Henry Frank is 55 feet in width. It is upon this platform that are placed the cotton bales, these being gradually piled up on it in such a way as to entirely hide the passenger saloons. Care is taken to preserve embrasures between the bales for the entrance of air and light to the interior. When the loading is finished, the bales of cotton fill all the side spaces of the steamer and extend to the upper promenade deck.

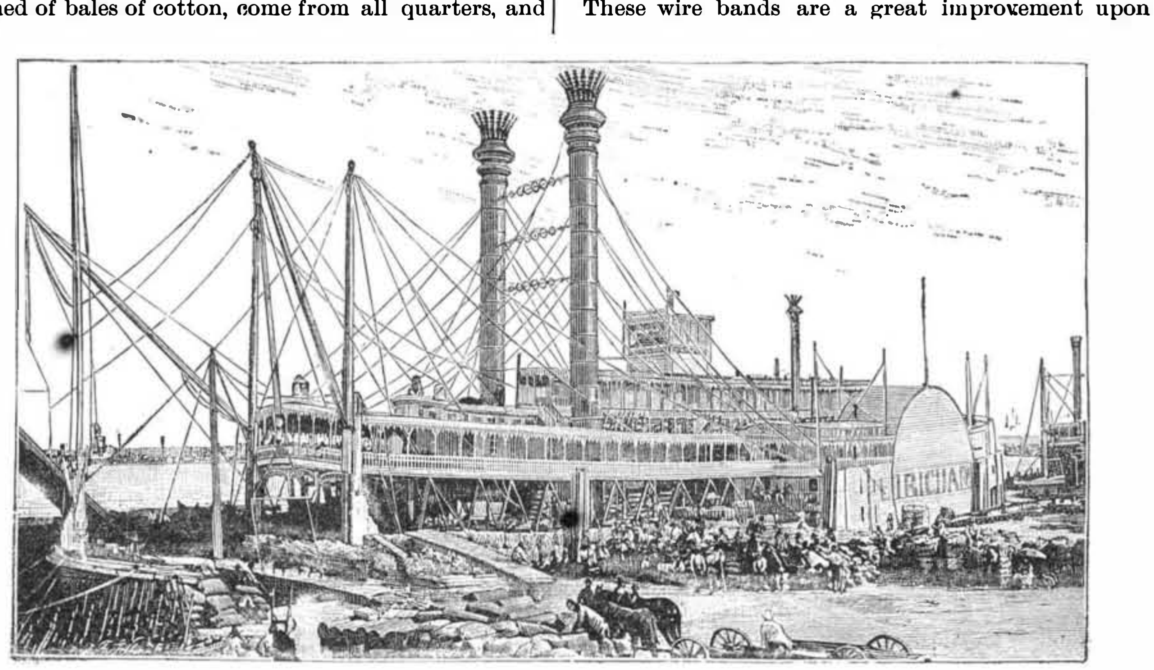
The weight of all these bales (averaging 450 lb. each) causes the boat to sink so that the water nearly reaches the first row upon the platform, and often wets it, through the vessel's motions.

After the cargo has been discharged upon the wharf, merchants come to make their purchases, and the bales are at once sent to the cotton presses to be reduced in size. One of the characteristic sights of the city is the quarter where the vast pressing establishments are situated. There are nearly twenty-five of these in New Orleans, each of which cost about a hundred thousand dollars to fit up. They contain a large number of presses of different styres, but the ones most used are Taylor's Hydraulic and the New Morse. The latter have been the favorites since 1877. There are over fifty of them in the city, while there are only about thirty of the Taylor. Mr. Morse, the inventor, has manufactured a large number of models since 1872, but his last apparatus, the New Morse, seems to combine all the qualities of economy, strength, and power. Many of these apparatus have already pressed from 500,000 to 1,000,000 bales without having undergone any wear and tear. It is curious to watch the machine while in operation. The bale of cotton is picked up by negroes, who put it into the press, which is at once set in action. The press flattens the bale, through its formidable weight of five million pounds, and reduces it by nearly three-quarters of its original dimensions. Covered with coarse sacking, the bale is bound with strips of sheet iron that are passed through apertures formed with this intent in the compressing plates. These iron bands are then fastened by the workmen, and the machine ejects the bale automatically, in order to receive another.

These wire bands are a great improvement upon the rope that was formerly used for the same purpose. They were invented and further simplified by Messrs. L. Miller and S. H. Gilman. It is a great advantage for the steamers to have the bales pressed, as they can thus carry a much larger number of them, and so they pay a fee of 65 cents per bale. About two million bales are annually exported.

Two-thirds of the city's population are occupied in this trade. The value of the exports may be estimated at $100,000,000 per annum.

One of the most important questions to be decided, upon the subject of presses, has been as to



A MISSISSIPPI RIVER STEAMBOAT.

* Extract from "Letters from America," by A. Tissandier, in *La Nature*.